

# MechTrans

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## Certificate

I, Julia Harwardt, of 33, Millmount Road, Sheffield, South Yorkshire, S8 9EG, hereby declare that I am the translator of the Priority document attached

with the application no. 103 03 050.6 and with the application date 24<sup>th</sup> January 2003

and certify that the following is a true translation of the best of my knowledge and belief.

Signature of Translator

J. Harwardt

Dated this 24<sup>th</sup> day of March 2006

**THE FEDERAL REPUBLIK OF GERMANY**

**Certificate of priority about the filing of a patent application**

**Application Number:** 103 03 050.6

**Filing Date:** 24<sup>th</sup> January 2003

**Applicant/Owner:** GKN Walterscheid GmbH, Lohmar/DE

**Title:** Generator unit for tractors and electrical drive system  
for agricultural devices

**IPC:** B 60 L, A 01 B, A 01 C

The attached documents are a correct and true reproduction of the original documents  
of this patent application.

Munich, 24<sup>th</sup> November 2003

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The President

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Sieck

GKN Walterscheid GmbH  
Hauptstraße 150  
53797 Lohmar

December 3, 2003  
Hw/wir (20030594)  
Q01025US10

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Generator unit for tractors and electrical drive system for agricultural devices

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Claims

1. Generator unit for tractors (1) comprising
  - a housing (4), which can be non-rotationally connected to a component of the tractor (1),
  - an input shaft,
  - rotationally supported in the housing (4),
  - connectable to a power take-off shaft (2) of the tractor (1),
  - an electrical generator (6) having a rotor, which is driving-wise connected to the input shaft and is driven by the same, and a stator, coupled to the housing (4),
  - wherein the electrical generator (6) serves for driving electrical loads of the tractor (1) or of an agricultural device.
2. Generator unit according to claim 1,  
characterised in that  
an output shaft (5) is provided,
  - which is driving-wise connected to the input shaft and
  - which can be connected to the drive shaft of an agricultural device.
3. Generator unit according to claim 2,  
characterised in that  
the input shaft and the output shaft (5) are formed as a unified compo-

nent.

4. Generator unit according to claim 2 or 3,  
characterised in that  
the output shaft (5) has on that end, with which it can be connected to  
the agricultural device, the same profile, as the power take-off shaft (2)  
of the tractor (1).
5. Generator unit according to one of claims 2 to 4,  
characterised in that  
between the input shaft and the rotor of the electrical generator (6) a  
gear is provided.
6. Generator unit for agricultural devices comprising,
  - a housing (4), which can be non-rotationally connected to a  
component () of the agricultural device,
  - a hydraulic motor (9), which can be connected to a hydraulic  
pressure source (12) of the agricultural device and is driven by  
the same,
  - an electrical generator (8) having a rotor, which is driving-wise  
connected to the hydraulic motor (9) and is driven by the same,  
and a stator, connected to the housing (4),
  - wherein the electrical generator (8) serves for driving electrical  
loads of the agricultural device.
7. Generator unit according to one of claims 1 to 6,  
characterised in that  
the electrical generator (6, 8) is a generator with a nominal voltage of  
42 Volts.
8. Drive system for agricultural devices having a generator unit according  
to one of claims 1 to 7, comprising
  - electrical motors (16, 17), which are fed with electrical energy by  
the electrical generator (6) and by which working units of the ag-

**gricultural devices are driven.**

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Description

[0001] The invention relates to a generator unit for tractors and an electrical drive system for agricultural devices for driving electrical loads of agricultural devices, as for example working units for control devices, mowing devices, field sprayers or spraying devices.

[0002] Conventionally this type of working units are driven mechanically. If these are attachment devices for a tractor or agricultural devices pulled by a tractor, the working units are connected by means of a mechanical drive line to a power take-off shaft of the tractor, wherein the power take-off shaft is driven by the main drive, generally a combustion motor, of the tractor.

[0003] In self-propelled agricultural working devices the working units are driven directly by the main drive.

[0004] Hydraulic drive systems are also known, in which the main drive drives a hydraulic pump, serving as the hydraulic pressure source. Via hydraulic lines hydraulic motors are driven, which again drive the working units.

[0005] These conventional drive systems have a multitude of mechanical drive components, which are dimensioned according to the to be transmitted torque. This leads to large and heavy drive systems. The assembly of the

drive components is, therefore, cumbersome.

[0006] For driving small loads electrical motors have already been used in self-propelled vehicles, which are connected to the vehicle electric system of the vehicle. These vehicle electric systems have, however, generally only a battery nominal voltage of 12 Volts and a generator nominal voltage of 14 Volts. This is, however, not sufficient for driving electrical loads of drive units of agricultural devices, as the electrical loads are too high.

[0007] The object of the present invention is, to propose a generator unit, by means of which common tractors or agricultural machines with a low nominal voltage of the vehicle electric system can be converted, to be able to drive electrical loads with higher nominal voltages than those of the electrical wiring.

[0008] The object is solved according to the invention by a generator unit for tractors comprising

- a housing, which can be non-rotationally connected to a component of the tractor,
- an input shaft,
  - rotationally supported in the housing,
  - connectable to a power take-off shaft of the tractor,
- an electrical generator having a rotor, which is driving-wise connected to the input shaft and is driven by the same, and a stator, coupled to the housing,
- wherein the electrical generator serves for driving electrical loads of the tractor or of an agricultural device.

[0009] Therefore, any tractor with a power take-off shaft and a common electrical wiring can be converted in such a way, that electrical loads can be driven by a nominal voltage differing from the nominal voltage of the electrical wiring. Common electrical wiring systems have 12 Volts or 24 Volts. In 12 Volts-electrical wiring systems the battery nominal voltage is 12 Volts and the generator nominal voltage is 14 Volts. In 24 Volts-electrical wiring systems the

battery nominal voltage is 24 Volts and the generator nominal voltage is 28 Volts.

[0010] With the generator unit according to the invention the tractor can be adapted to an additional electrical wiring with higher nominal voltages. As a rule the nominal voltages are a multiple of a 12-Volt- electrical wiring system. Therefore, for example, a 42 Volt- electrical wiring system can be provided, in which the battery nominal voltage is 36 Volts and the generator nominal voltage is 42 Volts.

[0011] An output shaft can be provided, which is driving-wise connected to the input shaft and which can be connected to the drive shaft of an agricultural device.

[0012] Therefore, the power take-off shaft can serve for the mechanical drive of individual drive units, as the output shaft can be connected concerning the driving via the input shaft to the power take-off shaft.

[0013] Advantageously, the input shaft and the output shaft are formed as a unified component.

[0014] To be able to connect standardised drive elements, as for example universal shafts, to the output shaft, the output shaft has on that end, with which it can be connected to the agricultural device, the same profile, as the power take-off shaft of the tractor.

[0015] To achieve with the electrical generator the required electrical power, a gear can be provided between the input shaft and the rotor of the electrical generator.

[0016] The object is further solved by a generator unit for agricultural devices comprising,

- a housing, which can be non-rotationally connected to a component of the agricultural device,

- a hydraulic motor, which can be connected to a hydraulic pressure source of the agricultural device and is driven by the same,
- an electrical generator having a rotor, which is driving-wise connected to the hydraulic motor and is driven by the same, and a stator, connected to the housing,
- wherein the electrical generator serves for driving electrical loads of the agricultural device.

[0017] Hereby, any agricultural machines with a hydraulic supply can be provided at a later date with an electrical wiring system for the electrical supply, which nominal voltage differs from the nominal voltage of the conventional vehicle electric system.

[0018] Generally, also, in agricultural machines the nominal voltage of the electrical wiring system is 12 Volts or 24 Volts. With a generator unit according to the invention the agricultural machines can be provided with an additional electrical wiring system with 42 Volts.

[0019] The object is, further, solved by a drive system for agricultural machines with an above described generator unit, which has electrical motors, which are fed by the electrical generator with electrical energy and by which working units of the agricultural machines are driven.

[0020] Preferred embodiments of the invention are described in the following by means of the drawings. Herein,

[0021] Figure 1 is a perspective partial view of a tractor having a generator unit plugged onto a power take-off shaft,

[0022] Figure 2 is an explosive view of the tractor according to Figure 1 with a generator unit,

[0023] Figure 3 is a perspective view of a generator unit, driven by a hydraulic motor, and

[0024] Figure 4 shows a drive system for electrical motors.

[0025] Figures 1 and 2 show a tractor 1 in a partial view and are described together. The tractor 1 has a power take-off shaft 2 for driving agricultural devices. The power take-off shaft 2 is driving-wise connected to the main drive of the tractor 1, generally a combustion motor for driving the tractor 1, and is driven at a constant number of revolutions. Typical numbers of revolutions for a power take-off shaft are 540 rev/min and 1000 rev/min.

[0026] Onto the power take-off shaft 2 a generator unit 3 is plugged on. The generator unit 3 has a housing 4, held non-rotationally relative to the tractor 1. In the housing 4 an input shaft is provided, which has a bore, formed corresponding to the power take-off shaft 2. Generally the power take-off shaft 2 has longitudinal splines and the input shaft has splines formed in a counter fitting manner. The input shaft is connected to an output shaft 5 or is formed as a single component with the same, wherein the output shaft 5 is extended from the housing 4. The end of the output shaft 5 projecting from the housing 4 is formed, in profile, identical to the power take-off shaft 2, so that standardised drive components, as for example a universal shaft, could be connected in a non-rotational manner to the output shaft 5.

[0027] On the housing 4 an electrical generator 6 is mounted, having a stator, connected non-rotationally to the housing 4, and having a rotor, arranged to rotate around a rotational axis in the housing 4. The rotor is connected driving-wise to the input shaft. This can, for example, be achieved by means of a spur gear. Therefore, the electrical generator 6 is driven with the number of revolutions of the power take-off shaft 2 or, if a gear ratio between the input shaft and the rotor is provided, with an increased or reduced number of revolutions.

[0028] The tractor 1 can, therefore, be provided by simply plugging on of the generator unit 3 onto the power take-off shaft 2 with an electrical source of, for example 42 Volts, wherein the power take-off shaft 2 still can drive via the output shaft 5 mechanical drive units.

[0029] Figure 3 shows another embodiment of a generator unit 7. This has, also, an electrical generator 8, having a stator, held non-rotationally in a housing 19 of the generator unit 7, and a rotor, rotating relative thereto. The rotor is connected to a hydraulic motor 9 and is driven by the same. The hydraulic motor 9 has a first hydraulic connection port 10 and a second hydraulic connection port 11, wherein the first hydraulic connection port 10 is connected to a hydraulic pump 12 and the second hydraulic connection port 11 is connected to a hydraulic tank 13. The hydraulic pump 12 can be driven by the main drive of an agricultural equipment. Therefore, an agricultural equipment can be adapted in this simple way by means of integration of the generator unit 7 into the hydraulic system of the agricultural equipment.

[0030] Figure 4 shows a drive system, in which a generator unit 3 according to Figures 1 and 2 can be plugged onto a power take-off shaft of a tractor, wherein for clarity the tractor is not represented in this view. The generator unit 3 comprises an electrical generator 6, electrically connected to a control device 15. The control device 15 is again electrically connected to electromotors 16, 17, which, for example, serve for driving a rotary mowing disc 18 or other agricultural working devices. The control device 15 serves for operating the electromotors 16, 17 and for the control of the, thus structured additional vehicle electrical wiring system. The output shaft 5 of the generator unit 3 is connected to a universal shaft 14, by means of which further mechanically driven working units are driven.

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**Reference numeral list**

- 1 tractor
- 2 power take-off shaft
- 3 generator unit
- 4 housing
- 5 output shaft
- 6 electrical generator
- 7 generator unit
- 8 electrical generator
- 9 hydraulic motor
- 10 first hydraulic connection port
- 11 second hydraulic connection port
- 12 hydraulic pump
- 13 hydraulic tank
- 14 universal shaft
- 15 control device
- 16 electromotor
- 17 electromotor
- 18 rotary mowing disc
- 19 housing

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**Generator unit for tractors and electrical drive system for agricultural devices**

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**Abstract**

A generator unit for tractors 1 comprises a housing 4, which can be mounted non-rotationally on a component of the tractor 1, an input shaft, rotationally supported in the housing 4 and connectable to a power take-off shaft 2 of the tractor 1, an electrical generator 6, having a rotor, which is driving-wise connected to the input shaft and is driven by the same, and a stator, connected to the housing 6, wherein the electrical generator 6 serves for driving electrical loads of the tractor 1 or of an agricultural device.

**Figure 2**

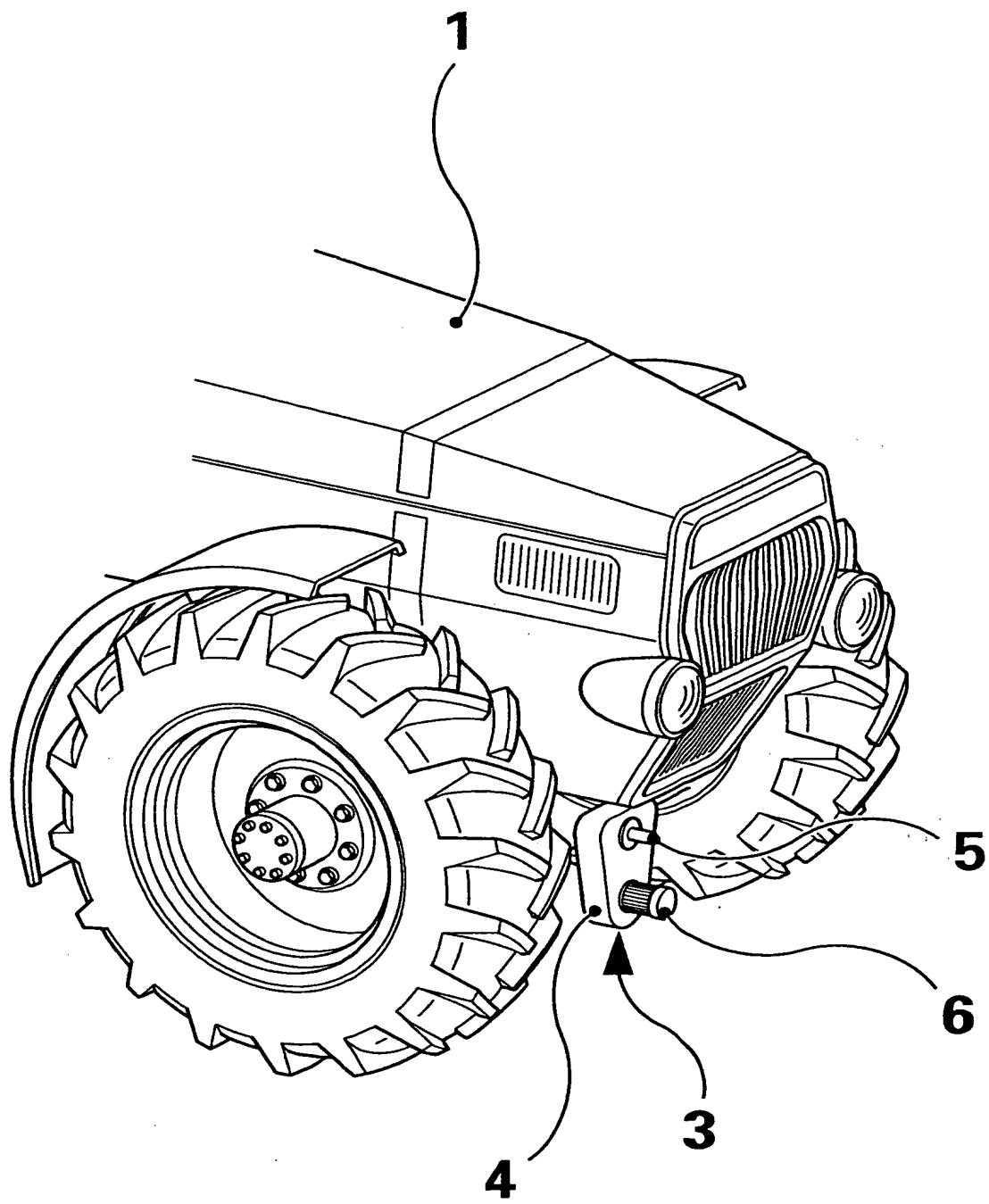


Fig. 1

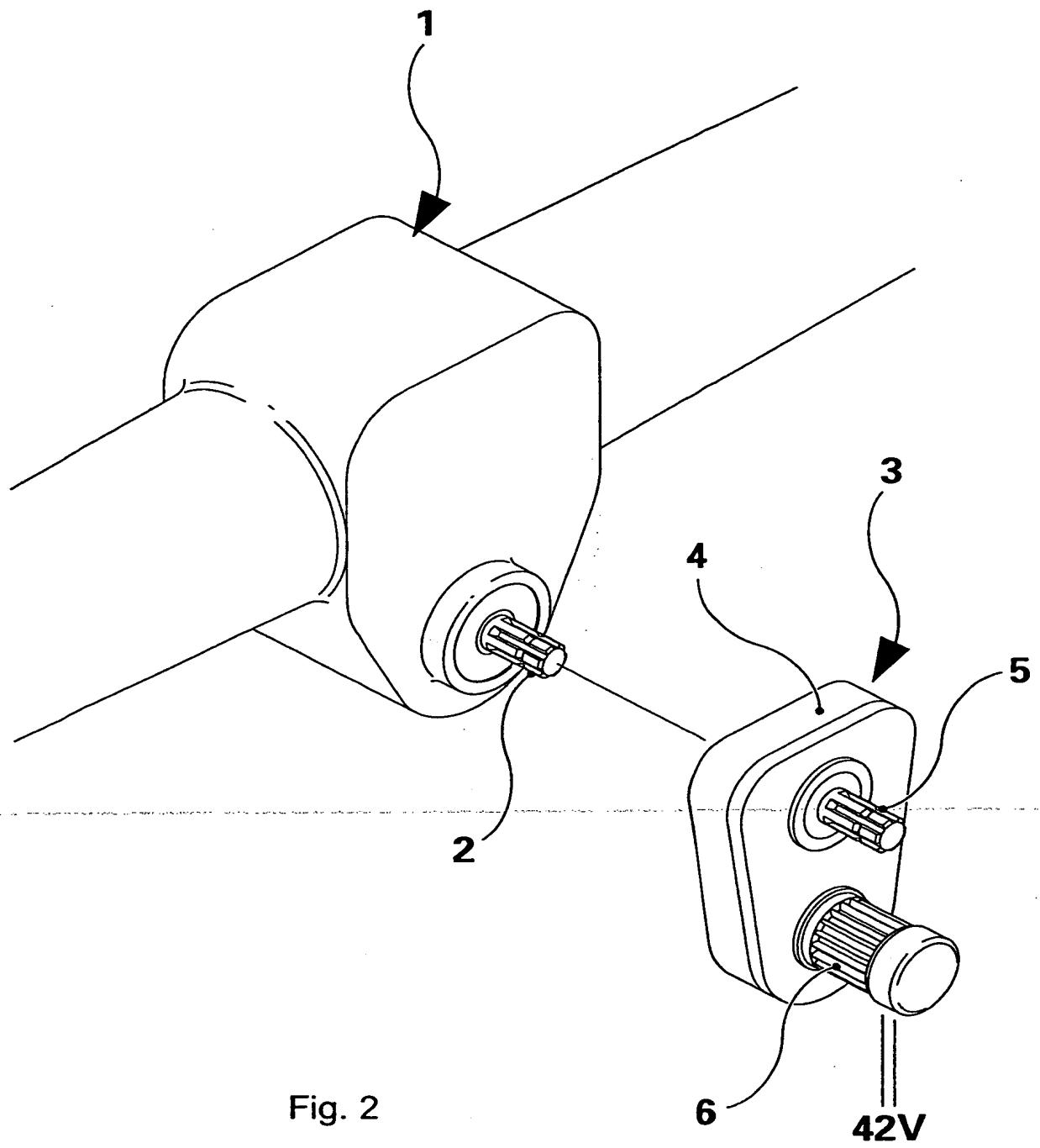


Fig. 2

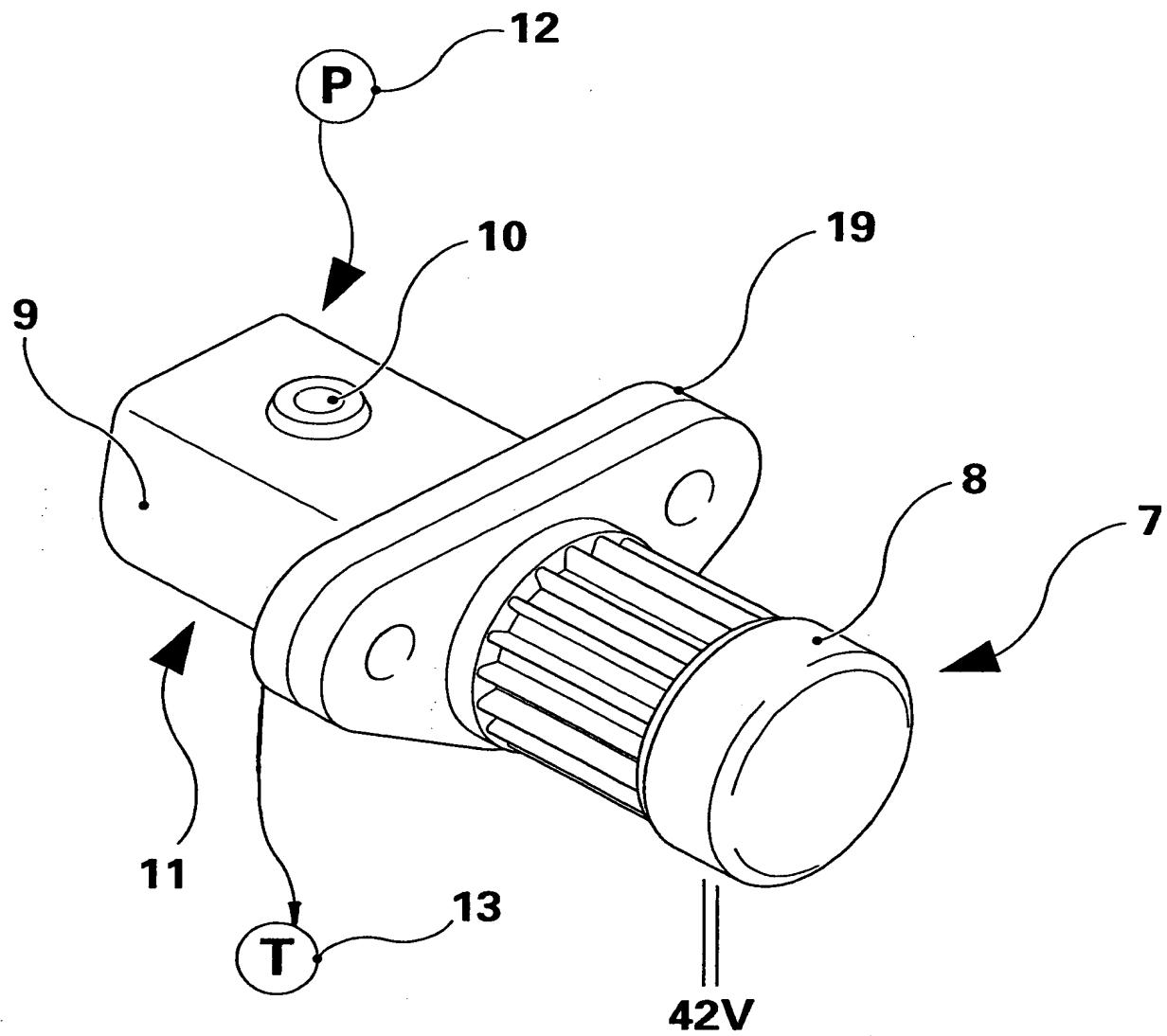


Fig. 3

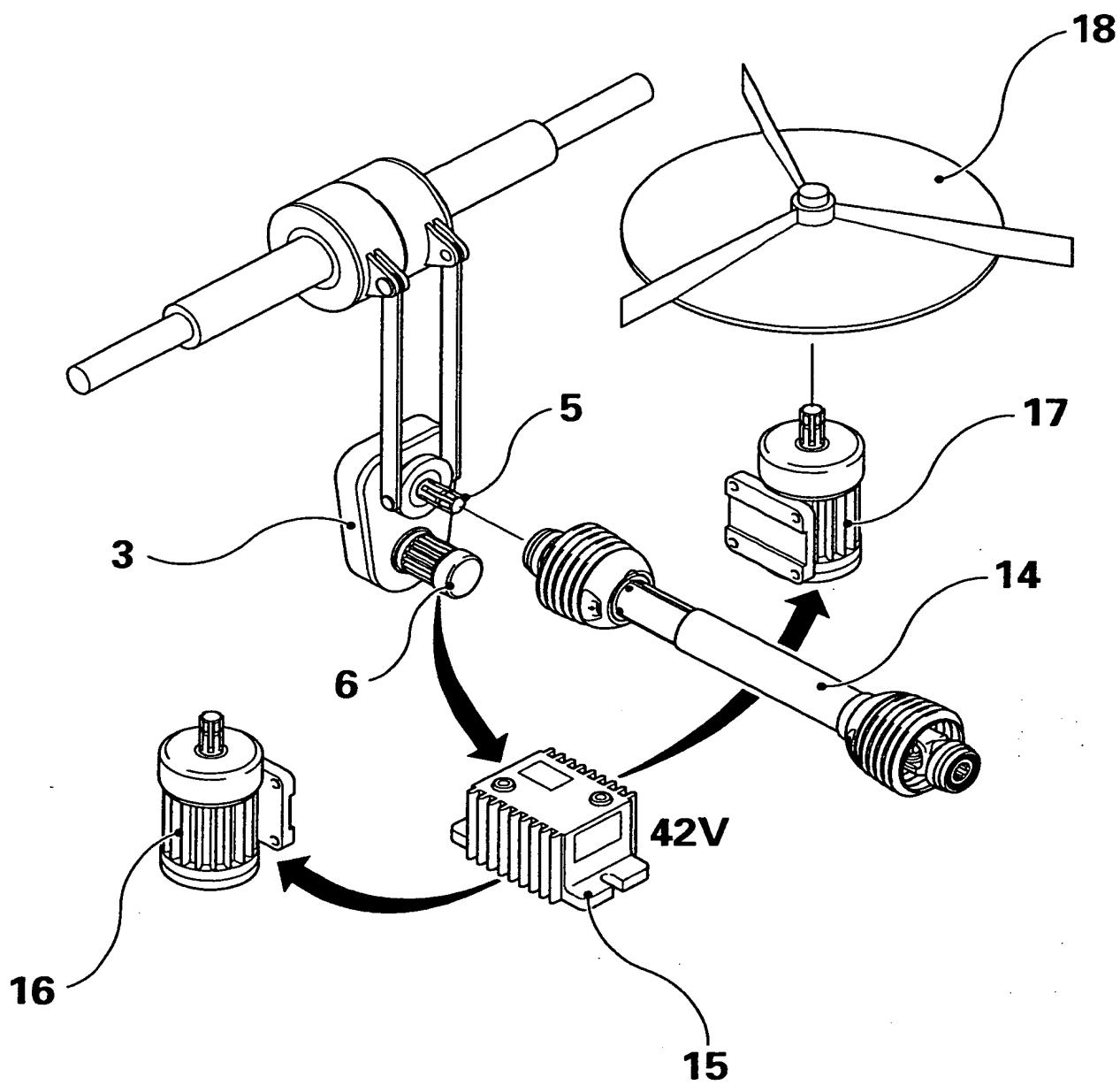


Fig. 4